HABITAT ASSOCIATIONS OF BUTTERFLIES IN THE PARAMBIKULAM WILDLIFE SANCTUARY, KERALA, INDIA[1]

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(*With one text-figure*)

Key words: Lepidoptera, diversity, habitats, forest, Kerala, Parambikulam Sanctuary

Habitat associations of 124 butterfly species were determined by analysing species records from five habitat types in the Parambikulam Wildlife Sanctuary, Kerala. The butterflies recorded belonged to 75 genera and 9 families. The families Nymphalidae, Pieridae, Lycaenidae and Satyridae were represented by the maximum number of species. Thirty-three species were present altogether in all the habitat types in the sanctuary. Fifteen species were found to be habitat specific, namely *Papilio buddha*, *Pathysa antiphates*, *Pachliopta pandiyana*, *Pantoporia ranga*, *Pareronia valeria hippia*, *Zipoetis saitis*, *Oriens concinna*, *Virachola perse ghela*, *Zesius chrysomallus* in the evergreen forests and *Ixias marianne*, *I. pyrene*, *Colotis etrida*, *C. danae*, *C. fausta*, *Ypthima ceylonica ceylonica* in the dry deciduous forests. Tropical wet evergreen forests possessed the greatest butterfly diversity in Parambikulam, followed by semi-evergreen and moist deciduous habitats. Significant reduction in butterfly diversity was observed in both dry deciduous habitats and teak plantations. Out of the butterflies recorded, 10 species are narrow endemic to Western Ghats and 18 species have protected status.

Introduction

Among invertebrates, butterflies are suitable for ecological studies, as the taxonomy, geographic distribution and status of many species are relatively well known. These insects, which are mostly phytophagous, serve as primary herbivores in the food chain and are also useful as pollinators of many angiosperms. As many butterflies are good bio-indicators of the environment, they can be used to identify ecologically important landscapes for conservation purposes.

Habitat is the single most important requisite for the proliferation and conservation of a butterfly species (Gilbert and Singer 1975, New 1990-92). All species prefer particular habitats, closely related to their life history: breeding behaviour, larval and adult food resources, etc. In many tropical countries, the rapid destruction of forest wealth has severely affected these butterfly habitats, which are slowly changing into hostile environs (Wells *et al.* 1983). The process has diverse ecological consequences. Many species, which were once common, have become rare. This in turn adversely affects the diversity and abundance of plant species dependent upon them. The identification of important landscapes and their conservation is, therefore, very important.

The butterfly fauna of India is quite well known (Evans 1932, Talbot 1939, 1947, Wynter-Blyth 1957, Larsen 1987, 1988). However, very few studies were conducted in the Western Ghats of Kerala (Fergusson 1891, Fraser 1930, Mathew and Rahmathulla 1993, Palot *et al.* 1997). An attempt is made here to discuss the habitat preferences of butterflies in the Parambikulam Wildlife Sanctuary, an important tropical forest location in Kerala.

Study Area

Parambikulam Wildlife Sanctuary (Fig. 1), a part of the Western Ghats, is situated in the Palghat district, Kerala (76° 35' E and 76° 50' E and between 10° 20' N and 10° 26' N). It opens up as a wide valley between the Nelliyampathy

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ranges in the north and Anaimalais in the south. The Sanctuary has a total area of 270 sq. km and a mean elevation of 600 m above msl. The vegetation is highly complex, a combination of Malabar and Deccan elements (Sebastine and Ramamurthy 1966). Different natural habitats include 1) the west coast tropical evergreen forest, 2) west coast semi-evergreen forest, 3) south Indian moist deciduous forest, and 4) south Indian dry deciduous forest. The man-made habitats include plantations of teak and eucalyptus covering 90 sq. km and 3 sq. km respectively, and small patches of bamboo and reeds. About 28 sq. km of the Sanctuary are occupied by the reservoir. The microhabitats in the Sanctuary include marshy fields or *vayals* and banks of rivers and streams.

Material and Methods

As part of a study on the diversity of a selected group of insects during 1995-97, observations were made by laying belt transects in the Karienshola (evergreen forests), Ammakundu (moist deciduous forests), Thekkady-Keerappady (dry deciduous forests) and Thunacadavu (teak plantations) areas from June 1996 to May 1997. These sites were chosen as representatives of the habitat types in the study area. Each transect was covered twice in a month, between 1000 hrs and 1400 hrs, and observations including the identity of the butterflies encountered were recorded. Sample specimens were collected only if they were needed for identification. Occasional observations were made in other parts of the Sanctuary like Poopara, Orukombankutty, Kuriarkutty, Velayudhankayi, Seechali and Thellikkal.

The identification was done with the help of butterfly collections in the Kerala Forest Research Institute, Peechi, the National Collections at the Zoological Survey of India and the Pusa Collections, Indian Agricultural Research Institute, New Delhi, and with reference to Wynter-Blyth (1957) and D'Abrera (1982, 1985, 1986).

Based on their occurrence in different habitats, the butterflies were categorised as follows:

1. Common (C) - Present in 4 or more habitats
2. Uncommon (UC) - Present in 2-3 habitats
3. Rare (R) - Present in 1 habitat only

Results

Butterflies of 124 species, belonging to 75 genera and 9 families were collected and identified. A list of species with their habitat associations is given in Table 1. Most of the butterflies collected belonged to Nymphalidae (28 species), Pieridae (22 species), Lycaenidae (20 species), Satyridae (16 species) and Papilionidae (15 species).

Butterfly associations in different habitats in the study area are discussed below.

Tropical evergreen forests: In Parambikulam, such forests are seen in Karianshola, Pulikkal, Karappara and Orukomban areas. Small patches of evergreen forests also occur at Karimalagopuram and Shettiwaramalai. Butterflies like *Papilio buddha*, *P. paris*, *Pathysa antiphates*, *Idea malabarica malabarica*, *Vindula erota saloma*, *Parthenos sylvia virens* etc., are seen in the forest canopies of this habitat. The understorey is occupied mostly by shade loving species that are excellent mimics of their surroundings like *Lethe rohria neelgheriensis, Ypthima* spp. and *Melanitis* spp. Species like *Cethosia nietneri mahratta*, *Cupha erymanthis maja*, *Catopsilia* spp., *Papilio helenus*, *Tagiades litigiosa* and *Celaenorrhinus ambareesa* are observed in forest clearings formed as a result of tree falls.

Semi-evergreen forests: Semi-evergreen forests appear where evergreen forests merge into moist deciduous forests. The vegetation is a combination of both evergreen and moist deciduous elements. Butterflies present here are common to both evergreen and moist deciduous forests. Species like *Papilio helenus*, *Charaxes*

TABLE 1
DISTRIBUTION OF BUTTERFLIES IN VARIOUS HABITATS IN THE STUDY AREA

Family / Species	*Habitats*				
PAPILIONIDAE	EVG	SEV	MDF	DDF	PLN
Graphium sarpedon teredon Felder	*	*	*	*	*
G. agamemnon Linnaeus	*	*	*	*	*
G. doson eleius Fruhstorfer	*	*			
Pachliopta aristolochiae Linnaeus	*	*	*	*	*
P. hector Linnaeus	*	*	*	*	*
P. pandiyana Moore	*				
Papilio polytes thesus Cramer	*	*	*	*	*
P. demoleus Linnaeus	*	*	*	*	*
P. paris tamilana Moore	*	*	*		
P. buddha Westwood	*				
P. helenus Linnaeus	*	*	*		*
P. polymnestor parinda Moore	*	*	*	*	*
P. dravidarum Wood-Mason	*	*			
Pathysa antiphates (Fabricius)	*S				
Troides minos Cramer	*	*	*	*S	*
NYMPHALIDAE					
Cethosia nietneri mahratta Felder	*	*	*		
Charaxes bemardus imna Butler	*	*			
Cirrochroa thais thais Fabricius	*	*	*		
Cupha erymanthis maja Fruhstorfer	*	*	*		
Ariadne ariadne indica Moore	*	*	*	*	*
A. merione merione Cramer	*	*	*	*	*
Polyura athamas athamas Drury	*	*	*		*
Euthalia lubentina arasada Fruhstorfer	*	*	*		
E. aconthea meridionalis Fruhstorfer	*	*	*		
Hypolimnas bolina Linnaeus	*	*	*		*
H. misippus Linnaeus	*	*	*		*
Junonia orithya swinhoei Butler	*	*	*		*
J. lemonias Linnaeus	*	*	*	*	*
J. hierta Fabricius	*	*	*	*	*
J. almana Linnaeus	*	*	*		*
J. atlites Linnaeus	*	*	*		*

TABLE 1 (CONTD.)
DISTRIBUTION OF BUTTERFLIES IN VARIOUS HABITATS IN THE STUDY AREA

Family / Species	*Habitats*				
	EVG	SEV	MDF	DDF	PLN
J. iphita pluvialis Fruhstorfer	*	*	*	*	*
Kaniska canace viridis Evans	*	*	*		
Moduza procris Cramer	*	*	*		*
Neptis hylas varmona Moore	*	*	*	*	*
N. jumbah jumbah Moore	*	*	*		*
Pantoporia hordonia Stoll	*	*	*		
P. ranga (Moore)	S				
Parthenos sylvia virens Moore	*	*			
Phalanta phalanta Drury	*	*	*		
Tanaecia lepidea miyana Fruhstorfer	*	*	*		
Vanessa cardui Linnaeus	*	*	*		
Vindula erota saloma Swinhoe	*	*	*		*
AMATHUSIIDAE					
Discophora lepida lepida Moore	*	*			
SATYRIDAE					
Lethe rohria neelgheriensis Guerin	*	*	*		*
L. europa Fabricius	*	*			
Melanitis leda leda Drury	*	*	*		*
M. phedima varaha Moore	*	*	*		*
Mycalesis anaxias anaxias Hewitson	*	*	*		*
M. igilia Fruhstorfer	*	*	*		
M. patnia junonia Butler	*	*	*		
M. perseus Fabricius	*	*	*		
M. mineus polydecta Cramer	*	*	*		*
M. visala Moore	*	*	*		
Orsotriaena medus mandata Moore	*	*	*		
Ypthima ceylonica ceylonica Hewitson				*	
Y. baldus madrasa Evans	*	*	*	*	*
Y. philomela Linnaeus	*	*	*		
Y. huebneri Kirby	*	*	*	*	*
Zipoetis saitis Hewitson	*				
ACRAEIDAE					
Acraea terpsicore Linnaeus	*	*	*	*S	
DANAIDAE					
Danaus genutia genutia Cramer	*	*	*	*	*
D. chrysippus chrysippus Linnaeus	*	*	*	*	*

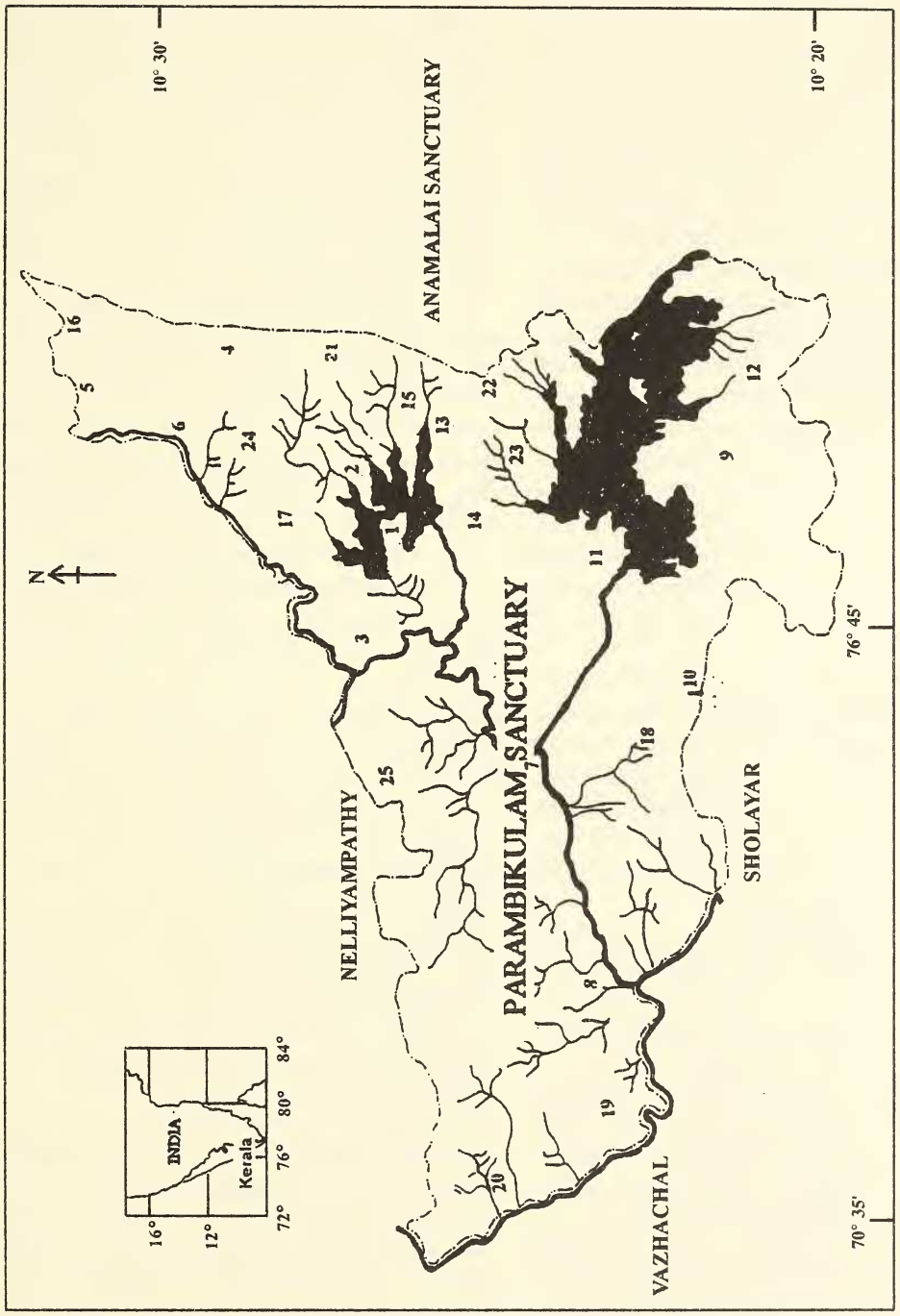
TABLE 1 (CONTD.)
DISTRIBUTION OF BUTTERFLIES IN VARIOUS HABITATS IN THE STUDY AREA

Family / Species	*Habitats*				
	EVG	SEV	MDF	DDF	PLN
Euploea core core Cramer	*	*	*	*	*
Idea malabarica malabarica Moore	*	*			
Parantica aglea aglea Cramer	*	*	*	*	*
P. nilgiriensis Moore	*	*	*		
Tirumala limniace leopardus Butler	*	*	*	*	*
PIERIDAE					
Appias libythea libythea Fabricius	*	*	*	*	*
A. lyncida latifascia Moore	*	*	*	*	*
A. albina darada Felder	*	*			
A. indra shiva Swinhoe	*	*	*		
Anapheis aurota Fabricius	*	*	*		*
Catopsilia pomona pomona Fabricius	*	*	*	*	*
C. pyranthe Linnaeus	*	*	*	*	*
Cepora nerissa phryne Fabricius	*	*	*	*	
C. nadina remba Moore	*	*			
Colotis fausta (Olivier)				*	
C. etrida Boisduval				*	
C. danae Fabricius				*	
Delias eucharis Drury	*	*	*	*	*
Eurema laeta laeta Boisduval	*	*	*	*	*
E. hecabe Linnaeus	*	*	*	*	*
E. blanda Boisduval	*	*	*	*	*
E. brigitta rubella Wallace	*	*	*		*
Hebomoia glaucippe australis Butler	*	*	*	*	*
Ixias pyrene sesia Linnaeus				*	
I. marianne Cramer				*	
Leptosia nina nina Fabricius			*	*	
Pareronia valeria hippia Fabricius	*S				
LYCAENIDAE					
Caleta caleta Hewitson	*	*	*		*
Castalius rosimon (Fabricius)	*	*	*	*	*
Celastrina lavendularis Moore	*	*	*		
Cheritra freja (Fabricius)	*	*	*		
Chilades pandava pandava Horsfield	*	*	*		
Curetis dentata dentata Moore	*	*	*		

TABLE 1 (CONTD.)
DISTRIBUTION OF BUTTERFLIES IN VARIOUS HABITATS IN THE STUDY AREA

Family / Species	*Habitats*				
	EVG	SEV	MDF	DDF	PLN
Virachola perse ghela (Fruhstorfer)	S				
Discolampa ethion vavasanus Fruhstorfer	*	*	*		*
Euchrysops cnejus cnejus Fabricius	*	*	*		*
Jamides alecto (Felder)	*	*	*		*
J. celeno (Cramer)	*	*	*	*	*
J. bochus bochus Cramer	*	*			
Loxura atymnus Cramer	*	*	*		
Neopithecops zalmora dharma Moore	*	*			
Spindasis vulcanus vulcanus Fabricius	*	*	*		
S. schistacea schistacea Moore	*	*	*		
Talicada nyseus nyseus Guerin	*	*			
Udara akasa Horsfield	*	*	*		
Zesius chrysomallus Hubner	*S				
Zizina otis decreta Butler	*	*	*		*
HESPERIIDAE					
Badamia exclamationis Fabricius	*	*	*		
Celaenorrhinus leucocera Kollar	*	*			
C. ambareesa Moore	*	*	*		*
Hasora chromus chromus Cramer	*	*	*		
Iambrix salsala luteipennis Plotz	*	*	*		
Oriens concinna El.	*				
Odontoptilum angulata Felder	*	*	*		
Potanthus pava pava Fruhstorfer	*	*	*		
Pelopidas subochracea subochracea Moore	*	*			
Spialia galba Fabricius	*	*	*		
Tagiades litigiosa Moschler	*	*	*		*
Taractrocera ceramas ceramas Hewitson	*	*	*		
Telicota ancilla bambusae Moore	*	*	*		*

Abbreviations: EVG - Evergreen; SEV - Semi-evergreen; MDF - Moist Deciduous Forest; DDF - Dry Deciduous Forest; PLN - Teak Plantation; S - Single observation during the entire study period



1. Thunacadavu; 2. Sungam; 3. Thellickal; 4. Karianshola; 5. Thekkadi; 6. Elathodu; 7. Kuriarkutty; 8. Orukombankutty; 9. Poopara; 10. Karimalagopuram; 11. Parambikulam; 12. Muduva colony; 13. Vengolimala; 14. Pillakkal; 15. Seechalipallam; 16. Keerappadi; 17. Ponnamudi; 18. Kottayali; 19. Muthuvarachal; 20. Puliyalapara; 21. Anappady; 22 Vengoli; 23. Veyakkadamudi; 24 Padippara; 25. Thoothampara.

Fig.1: Map of Parambikulam Wildlife Sanctuary showing study sites

bernardus imna, *Cirrochroa thais thais*, *Tanaecia lepidea miyana*, *Polyura athamas athamas*, *Phalanta phalanta*, *Hypolimnas* spp., *Neptis* spp. and *Junonia* spp. are commonly found here. Besides a few species of *Papilio paris tamilana*, *Vindula erota saloma* and *Parthenos sylvia virens* are also occasionally sighted. The understorey species are more or less same as in the evergreen forest habitat.

Moist deciduous forests: In the Sanctuary, such forests cover 60 sq. km area. They are mostly encountered along the ridges and lower slopes.

Several species of butterflies which are generally common in the study area like *Neptis hylas varmona*, *Ariadne ariadne indica*, *Papilio demoleus*, *Euploea core core*, *Tirumala limniace leopardus*, *Junonia* spp., *Pachliopta* spp. etc are encountered in this habitat. Species like *Charaxes bernardus imna*, *Polyura athamas athamas*, *Appias lyncida latifascia*, and *Tanaecia lepidea miyana* are occasionally sighted here during June-July.

The forest understorey species showed remarkable seasonal variation in this habitat. Species like *Eurema hecabe*, *E. blanda*, *Ypthima baldus madrasa* and *Y. huebneri* are seen throughout the year. During June-July species like *Melanitis leda leda*, *M. phedima varaha*, *Mycalesis igilia*, *I. patnia junonia* and *M. perseus* can also be sighted.

Dry deciduous forests: This type of forest is seen in the Thekkady-Keerappady region, and constitutes only 15 sq. km. The climate is extremely dry with very low rainfall. The forests are mainly thorny bush and scrub jungles.

These forests are seen only in a small patch, and the butterfly fauna here is unique and varied. Canopy species include *Danaus chrysippus*, *Hebomoia glaucippe australis* and *Cepora nerissa phryne*, along with *Catopsilia* spp., *Junonia* spp. and *Appias* spp. A single specimen of *Troides minos* was also sighted in January.

This habitat harbours the most distinctive understorey fauna in the Sanctuary. Species like *Ixias marianne*, *I. pyrene sesia*, *Colotis fausta*, *C. danae*, *C. etrida* and *Ypthima ceylonica ceylonica* are confined to this habitat. Species like *Leptosia nina nina*, *Ypthima baldus madrasa*, *Y. huebneri* and *Eurema* spp. are also common.

Teak plantations: The teak plantations here are in a state of reversion. Deciduous species like *Cassia fistula*, *Cordia dichotoma*, *Butea monosperma*, *Grewia tiliaefolia* and *Randia* spp. appear, intermingled with teak trees.

The butterfly community is a mosaic, with species from moist deciduous and semi-evergreen forests dominating. Species like *Neptis jumbah jumbah*, *Vindula erota saloma*, *Papilio helenus*, *Tanaecia lepidea* were recorded during the wet months. Understorey fauna also shows similar affinity to moist deciduous forests, with species like *Melanitis leda leda*, *Mycalesis mineus polydecta*, *Ypthima* spp. and *Eurema* spp.

***Vayals* or marshes**: Butterflies which prefer bright sunlight and open areas inhabit this habitat. Danaid butterflies like *Tirumala limniace leopardus*, *T. septentrionis dravidarum*, *Parantica aglea aglea*, *P. nilgiriensis* and Nymphalids like *Junonia atlites*, *J. iphita pluvialis*, *Euploea core core* and Pierids like *Eurema* spp. and *Appias* spp. are common. Aggregations of mud puddling butterflies of the species *Appias indra shiva*, *A. libythea libythea*, *Cepora nadina remba*, *Graphium sarpedon teredon* and *Jamides* spp. are characteristic of *vayals*. Small scale population build-up of *Tirumala limniace leopardus*, *T. septentrionis dravidarum*, *Parantica aglea aglea*, *Danaus chrysippus*, *D. genutia genutia* and *Euploea core core* were also seen in summer.

Banks of rivers and streams: Two major river valleys, the Parambikulam and the Sholayar are present in the Sanctuary. These two rivers converge at Orukombankutty and flow into the main Chalakkudy river. Species like *Kaniska canace viridis*, *Graphium sarpedon teredon*, *Caleta caleta*, *Castalius rosimon*, *Discolampa ethion vavasanus* and *Jamides* spp. were recorded

from the banks of these rivers and streams.

Protected and endemic butterflies: Eighteen species recorded in this study come under the protected category as per the Indian Wildlife Act, 1972 (Table 2). Among them, the Lycaenid *Castalius rosimon rosimon*, the Nymphalid *Hypolimnas misippus*, and the Papilionid *Pachliopta hector* come under Schedule I of the Act. The rare species include the Satyrid *Mycalesis igilia*, the Hesperid *Odontoptilum angulata*, the Danaids *Parantica nilgiriensis* and *Idea malabarica malabarica*. The Papilionid *Papilio dravidarum* and the Lycaenid *Zesius chrysomallus* are considered very rare. Out of the 23 species, which are endemic to different biogeographic regions, 10 species are narrow endemics of Western Ghats and another 10 are endemic to south India and Sri Lanka, while the remaining 3 are endemic to Sri Lanka and the Indian subcontinent.

Discussion

The butterflies recorded from Parambikulam represent all the major families, with Nymphalidae, Pieridae, Lycaenidae, and Satyridae and Papilionidae dominating, followed by Hesperidae and Danaidae. Acraeidae and Amathusiidae are represented by only one species each. Altogether, 124 butterflies were collected and their habitat preferences recorded. Of them, 10 species are narrow endemic to Western Ghats. Eighteen species have protected status as per the Indian Wildlife Act, 1972 (Anon., 1990).

Some interesting and rare species such as *Discophora lepida*, *Pathysa antiphates*, *Papilio buddha*, *Pantoporia ranga*, *Pareronia valeria hippia* and *Charaxes bernardus imna* were recorded. The only representative of Acraeidae in south India, *Acraea terpiscore* has also been recorded from the Parambikulam forests.

With regard to the distribution, evergreen forest was found to be the most species-rich habitat (117 species). This was followed by semi-evergreen forests (108 species) and moist deciduous forests (95 species). Teak plantations were found to be inhabited by 57 species, which means that there is substantial reduction in butterfly diversity in this altered environment. Dry deciduous forest habitat, which covers only 5.26% of the sanctuary area, harbours the least number (41 species).

Parambikulam contains a number of different habitats and climate zones, as diverse in form and structure as wet evergreen forests and dry deciduous forests, which may account for the high species richness for butterflies. The number of species collected from Parambikulam (124) is higher than that from Silent Valley (100) (Mathew and Rahmathulla, 1993) and Periyar Tiger Reserve (119) (Palot *et al.*, 1997). Endemism in the fauna is also higher in Parambikulam (23 species) than in Silent Valley (13 species) and Periyar (19 species).

Among the butterflies recorded, 60 species are considered common in the sanctuary. These include 33 species observed in all the habitats studied, and 27 species present only in the four habitats. 49 species are considered uncommon as their distribution is limited to 2 or 3 habitats. The distribution of 15 species restricted to a particular habitat are considered rare, which include 9 species observed exclusively in evergreen forests viz., *Papilio buddha*, *Pathysa antiphates*, *Pachliopta pandiyana*, *Pantoporia ranga*, *Pareronia valeria*, *Zipoetis saitis*, *Oriens concinna*, *Virachola perse* and *Zesius chrysomallus*. Six species viz., *Ixias marianne*, *I. pyrene*, *Colotis etrida*, *C. fausta*, *Ypthima ceylonica* are observed exclusively in the dry deciduous habitat. Most of the butterflies observed in the *vayals* and the banks of rivers and streams are common species.

Significant variation was observed in habitat preference between the butterflies in the forest understorey and forest canopy. Forest understorey species like *Lethe rohria*, *Ypthima ceylonica*, *Ixias pyrene*, *Colotis fausta* showed

TABLE 2
LIST OF RARE AND ENDEMIC BUTTERFLIES RECORDED FROM PARAMBIKULAM

FAMILY/SPECIES	STATUS	ENDEMISM
Papilionidae		
Troides minos Cramer		Western Ghats
Pachliopta hector Linnaeus	Protected, Schedule I	South India & Sri Lanka
P. pandiyana Moore		Western Ghats
Papilio buddha Westwood	Protected, Schedule II	Western Ghats
P. dravidarum Wood-Mason	Very rare	Western Ghats
P. polymnestor parinda Moore		Peninsular India & Sri Lanka
Pieridae		
Appias libythea libythea Fabricius	Protected, Schedule IV	
Appias lyncida latifascia Moore	Protected, Schedule II	
A. albina darada Felder	Protected, Schedule II	Western Ghats
A. indra shiva Swinhoe	Protected, Schedule II	
Cepora nadina remba Moore	Wettest rainforests	
Delias eucharis Drury		South India & Sri Lanka
Nymphalidae		
Cirrochroa thais thais Fabricius	Only in wettest rainforests	South India & Sri Lanka
Cethosia nietneri mahratta Felder	Only in wettest rainforests	South India & Sri Lanka
Euthalia lubentina (Cramer)	Protected, Schedule IV	
Hypolimnas misippus Linnaeus	Protected, Schedule I	
Neptis jumbah jumbah Moore	Protected, Schedule I	
Parthenos sylvia Moore	Protected, Schedule II	
Tanaecia lepidea miyana Fruhstorfer	Protected, Schedule II	
Pantoporia ranga Moore	Protected, Schedule II	
Amathusiidae		
Discophora lepida lepida Moore	Protected, Schedule II	South India & Sri Lanka
Satyridae		
Mycalesis anaxias anaxias Hewitson	Protected, Schedule II	
M. igilia Fruhstorfer	Rare	Western Ghats
M. patnia junonia Butler		South India & Sri Lanka
Ypthima ceylonica ceylonica Hewitson		South India & Sri Lanka
Zipoetis saitis Hewitson	Protected, Schedule II	Western Ghats
Acraeidae		
Acraea terpsicore Linnaeus		Sri Lanka & Indian Subcontinent
Danaidae		
Parantica nilgiriensis Moore	Rare	Western Ghats
Idea malabarica malabarica Moore	Rare	Western Ghats
Lycaenidae		
Castalius rosimon rosimon Fabricius	Protected, Schedule I	
Euchrysops cnejus cnejus Fabricius	Protected, Schedule II	
Spindasis vulcanus vulcanus Fabricius		Sri Lanka & Indian Subcontinent
S. schistacea schistacea Moore		South India & Sri Lanka
Udara akasa Horsfield		Sri Lanka & Sri Lanka
Zesius chrysomallus Hubner	Very rare	Sri Lanka & Indian Subcontinent
Hesperidae		
Odontoptilum angulata (Feld.)	Rare	
Oriens concinna Elwes	Protected, Schedule IV	Western Ghats

remarkable habitat specificity compared to forest conopy species like *Cirrochroa thais*, *Papilio demoleus*, *Delias eucharis*, and *Hebomoia glaucippe*. This may be the reason why canopy butterflies (barring a few species) are common in the Sanctuary.

The habitat association of butterflies discussed here is based on the observed distribution in various habitats. One of the reasons for a species' association with a particular habitat could be the presence of its host plants. For example, the papilionid *Pachliopta pandiyana* recorded from the evergreen forest habitat can survive only on the habitat-specific evergreen shrub, *Thottea siliquosa* (Lam.) Hou (Aristolochiaceae). Similar ecological data for other butterfly species could help to interpret their habitat associations precisely.

The presence of a rich butterfly fauna in the Parambikulam Wildlife Sanctuary is indicative of the diverse habitats in the Sanctuary, which help in the proliferation and abundance of butterfly species. Holloway *et al.* (1992) observed that conversion of forests to plantation and other man-induced disturbances lead to reduction in the diversity of lepidopterans, both in species richness and in taxonomic and biogeographic quality. Parambikulam, with a variety of vegetation types, climatic zones, and remarkable endemism, must be given top priority for the conservation of its rich biodiversity.

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